

**AMERICAN SOCIETY OF HEATING, REFRIGERATING  
AND AIR-CONDITIONING ENGINEERS, INC.**

**1791 Tullie Circle, NE Atlanta, GA 30329 404-636-8400**

**TC/TG/TRG MINUTES COVER SHEET**

**(Minutes of all meetings are to be distributed to all persons listed below  
within 60 days following the meeting.)**

**TC/TG/TRG NO. TC4.11 DATE: 13 January 1999**

**TC/TG/TRG TITLE: Smart Building Systems**

**DATE OF MEETING: 23 June 98 LOCATION: Toronto**

<b>Members Present (note: members as of Toronto mtg)</b>	<b>Appt</b>	<b>Members Absent</b>	<b>Appt</b>	<b>Ex-Officio Members and Additional Attendance</b>
George Kelly	96-98	Arthur Dexter (int'l member)	96-00	Byungcheon Ahn
John Mitchell	96-00	Jeff Haberl	98-02	Michael Brambley
Les Norford	96-98	Barry Bridges	98-02	Michael Brandemuehl
Steve Blanc	98-02	Doug Nordham	96-98	Mark Breuker
Jim Braun	96-00	Patrick O'Neill	96-99	Marty Burns
Carol Lomonaco	96-99	Mark Bailey (CM)	98-	Terry Cornell
Philip Haves (int'l member)	96-00	Kirk Drees (CM)	96-	Brian Estill
Rich Hackner	98-02	Ira Goldschmidt (CM)	98-	Jakob Fredsted
James Gartner	98-02	Tim Ruchti (CM)	96-	Barrett Flake
Ron Kammerud	96-99	Greg Schoenau (CM)	96-	Al Guativa
Michael Kintner-Meyer	98-02	Peter Simmonds (CM)	98-	Young Duk Ju
John Seem (CM)	96-00	Jim Winston (CM)	96-	Srinivas Katipamula
John House (CM)	96-			Curt Klaassen

J. Carlos Haiad (CM)	96-			Janet Lynch
David Kahn (CM)	96-			Chuck McParland
Brian Kammers (CM)	96-			Dan Seth
Ron Nelson (CM)	98-			Gene Strehlow
				Jonathan West

**DISTRIBUTION:**

**ALL MEMBERS OF TC/TG/TRG**

**TAC CHAIRMAN:** Terry Townsend

**TAC SECTION HEAD:** Jeffrey Biskup

**ALL COMMITTEE LIASONS AS SHOWN ON TC/TG/TRG ROSTERS:**

**Program:** Emil E. Friberg **Manager Of Technical Services:** Martin J. Weilend

**Research:** Carl F. Speich **Manager Of Research:** William W. Seaton

**Standards:** Waller S. Clements **Manager Of Standards:** Claire B. Ramspeck

**ADDITIONAL DISTRIBUTION:** Visitors listed above

**ASHRAE TC ACTIVITIES SHEET**

**DATE:** 13 January 99 (committee positions for July 1998-June 1999)

**TG NO.** TC4.11 **TC TITLE:** Smart Building Systems

**CHAIR:** J. Braun **VICE CHAIR:** J. Mitchell

**TG Meeting Schedule**

Location, past 12 mo.	Date	Location, next 12 mo.	Date
San Francisco	1/20/98	Chicago	1/26/99
Toronto	6/24/98	Seattle	6/22/99

**TG Subcommittees**

Subcommittee	Chair
Fault Detection/Diagnosis	T. Rossi

Applications	J. House
Utility/Building Interface	M. Kintner-Meyer
Research	G. Kelly
Program	C. Lomonaco
Standards	R. Hackner
Handbook	M. Bailey

### Research Projects

1011-RP Utility/EMCS Communication Protocol Requirements

1020-RP Demonstration of Fault Detection and Diagnostic Methods in a Real Building

1043-RP Fault Detection and Diagnostic Requirements and Evaluation Tools for Chillers

### Long Range Research Plan (items 1-5) and Additional Work Statements (items 6-7)

Rank	Title	W/S Written ?	TG Approved ?	To RAC ?
1	Integrated Control for Building Services <sup>1</sup>	Yes	Yes	Yes
2	Survey of Degradation Fault Levels in Vapor Compression Air Conditioners	Yes (1 <sup>st</sup> draft)	No	No
3	Distributed and Hierarchical Fault Detection and Diagnosis of HVAC Systems	Yes (2 <sup>nd</sup> draft)	No	No
4	Prototyping and Field Testing of ASHRAE's Utility Consumer Interface Models (UCIM)	No	No	No
5	Development and Evaluation of Fault Detection and Diagnostic Methods for Chillers	No	No	No
6	Development of Simple Equipment Models to Use with Model-Based FDD Techniques for Vapor Compression Equipment	Yes (1 <sup>st</sup> draft)	No	No
7	Whole Building Fault Detection and Diagnostics	Yes (1 <sup>st</sup> draft)	No	No

1. The workstatement "Integrated Control for Building Services was approved by RAC subsequent to the Toronto meeting and was designated as 1113-TRP.

### Handbook Responsibilities - none

**Standards Activities - none****Technical Papers from Sponsored Research - none****TG Sponsored Symposia (past 3 years, present, planned)**

<b>Title</b>	<b>Date (Given or Planned)</b>
HVAC System Fault Detection And Diagnosis (Kelly)	Philadelphia, 1/97
Controlling Outdoor Air Ventilation for 62-1989 (Atkinson; TC 1.4 lead with TG4.SBS as co-sponsor)	Toronto, 6/98
FDD Using Real Building Data (Ahmed; TC4.6 lead with TC4.11 as co-sponsor)  Priority #5	Chicago, 1/99
FDD Methods and Evaluation (Castro) #1	Chicago, 1/99

**TG Sponsored Seminars (past 3 years, present, planned)**

<b>Title</b>	<b>Date (Given or Planned)</b>
The Utility/Building Interface: Redefining an Old Relationship (Blanc)	Boston, 6/97
BACnet in the Real World (Bushby; TC 1.4 lead with SSPC 135 BACnet and TG4.SBS as co-sponsors)	Boston, 6/97
Automated Response To Real Time Pricing (Kammerud)	San Francisco, 1/98
The Delivery of New Energy Services under Electric Industry Deregulation (Nordham; TC4.11 lead with TC 1.4 as co-sponsor)	San Francisco, 1/98
Benefits of Integrating HVAC with Non-HVAC Systems (Newman; TC 1.4 lead with SSPC 135 BACnet and TC4.11 as co-sponsors)	San Francisco, 1/98
Impact of Electromagnetic Interference on Control Systems and Global Standards (Coogan; TC 1.4 lead with TC4.11 and TC 1.9 as co-sponsors)	San Francisco, 1/98
New Platforms and Gateways for Connecting into Building Management Systems (Phelan)	Toronto, 6/98
The Latest Control Communications Technologies (Gartner; TC 1.4 lead with TC4.11 as co-sponsor)	Toronto, 6/98
Global View of Deregulation (Claar) #2	Chicago, 1/99

What is the Status of Smart Buildings and Where are They? (Lomonaco, TC4.11 lead with TC1.4 as co-sponsor) #3	Chicago, 1/99
Customer Experiences with Real-Time Pricing Electric Rates (Kintner-Meyer; TC4.11 lead with TC1.4 as co-sponsor #4	Chicago, 1/99
State-of-the-Art Control Devices, Sensors, Motors and Intelligent Actuators (Atkinson; TC1.4 lead with TC1.2, SSPC 135 BACnet, and TC4.11 as co-sponsors) #6	Chicago, 1/99
Practical Experiences in Applying DDC Systems for HVAC Fault Detection and Diagnosis (Bridges; TC1.4 lead with TC1.7, 9.9 and 4.11 as co-sponsors) #8	Chicago, 1/99
Achieving the Best of All Worlds: Different Approaches to Using Open Protocols in Building Control Systems (Nesler; TC1.4 lead with TC4.11 as co-sponsor)	Chicago, 1/99
Residential Smart Controls (Rosenthal; TC4.11 lead, with TC1.4 as co-sponsor)	Seattle, 6/99
Individual Controls: A Smart Building Approach (Lomonaco; TC4.11 lead, with TC1.4 as co-sponsor)	Seattle, 6/99
A Peek at a Real BACnet Building... GSA 450 Golden Gate BACnet Pilot Project (Blanc; TC4.11 lead, with TC1.4 co-sponsor)	Seattle, 6/99
Metering Issues and Realities in the World of Deregulation (Olken, McNally and Burns)	Seattle, 6/99
Alternate Communications...Powerline Carrier and Others (Bridges)	Seattle, 6/99
Communications and Other Issues Dealing with Life Safety, Fire Alarm, and HVAC Systems Integration (Kintner-Meyer)	Seattle, 6/99

**TG Sponsored Forums (past 3 years, present, planned)**

<b>Title</b>	<b>Date (Given or Planned)</b>
What Are The Priorities For On-Line HVAC Fault Detection And Diagnosis? (Haves)	Philadelphia, 1/97
Exactly What Do Smart Buildings and Control Systems Mean Today? (Newman and Kelly; TC 1.4 lead with TG4.SBS and TCs 1.5 and 4.6 as co-sponsors)	Boston, 6/97
Occupant Driven Interactive Building Control (Bridges; TG4.SBS lead with TC 1.4 as co-sponsor)	

Now That We Have the BACnet Standard Protocol, are DDC Programming Language and Application Standards Next? (Nesler; TC 1.4 lead with SPC 135 BACnet and TG4.SBS as co-sponsors)	San Francisco, 1/98
CAB and BACnet Similarities and Dissimilarities (Newman; TC 1.4 lead with SPC 135 BACnet and TG4.11 as co-sponsors)	Toronto, 6/98
How Can We Accomplish Multi-System Control Integration in Existing Facilities? (Coogan; TC1.4 lead with SPC 135 BACnet and TC4.11 as co-sponsors) #7	Chicago, 1/99
Who Will Improve Facility Comfort and IAQ in the Next Millenium...Designers, Installers, or Operating Engineers? (Gartner; tc1.4 lead, with TC9.9 and TC4.11 as co-sponsors) #9	Chicago, 1/99
What's ASHRAE's Role in Deregulation? (Blanc)	Seattle, 6/99
Should We Continue the Pursuit of Standard Programming Languages as an Adjunct to BACnet? (Nesler; TC1.4 lead, with TC4.11 co-sponsor)	Seattle, 6/99

**Journal Publications (past 3 years, present, planned)**

Title	When published
None	

Minutes summary and activities sheet submitted by: Les Norford, TC4.11 Secretary

**TC4.11 Minutes**

**Toronto: Tuesday, June 23, 1998**

**Roll Call, Introductions, Announcements**

Chairman Kelly called the meeting to order at 3:40 p.m. He distributed the agenda (the call-to-meeting letter and the agenda are in Appendix A) and noted that the Program and Research Subcommittee reports would switch places in the agenda order. Kelly then asked for a roll call and introductions. Eleven of 16 voting members were present: Kelly, Mitchell, Norford, Blanc, Braun (arrived during the meeting), Lomonaco, Haves, Hackner, Gartner, Kammerud, Kinter-Meyer.

A motion was made (Mitchell) and seconded (Blanc) to accept the minutes from the January 1998 meeting. The motion was approved unanimously.

Kelly's announcements included the following: ASHRAE proposes to charge session chairs and speakers a one-day registration fee; a symposium chair cannot have a paper in the chaired session; the Chicago program will be crowded; Marty Weilend will replace Claire Ramspeck as Manager of Technical Services; and ASHRAE encourages the development by technical committees of ASHRAE-approved Web sites.

Kelly recognized the TC liaisons. Carl Speich, RAC liaison, stated that ASHRAE Insights invited research ideas, which ASHRAE HQ will distribute to cognizant TCs. There is one idea for TC4.11. The TAC section head, Jeff Biskup, presented a plaque to Kelly in honor of Kelly's service as chair.

### **Fault Detection and Diagnosis Subcommittee Report (Seem)**

Seem stated that Purdue University (Braun, PI) started **RP-1043 (Fault Detection and Diagnostic Requirements and Evaluation Tools for Chillers)** ahead of schedule. The completion date for the final report has been advanced to September 1, 1999. The chiller for the project is a 40-Ton McQuay screw machine. A graduate student has been assigned to the project.

The subcommittee considered two work statements authored by Mark Breuker, both concerning vapor-compression equipment: **Survey of Degradation Fault Levels in Vapor Compression Air Conditioners (Research Priority #2)**, and **Development and Demonstration of Recursive Training Techniques for Model-Based FDD Methods for Vapor Compression Equipment (Research Priority #3)**. These workstatements are found in Appendices I and J. Breuker will receive assistance in revising both workstatements for the Chicago meeting. There were no updates on two other workstatements: **Distributed and Hierarchical Fault Detection and Diagnosis of HVAC Systems (Research Priority #6)** and **Whole Building Fault Detection and Diagnostics (Research Priority #7)**.

The subcommittee discussed two symposia for Chicago: **"FDD Methods and Evaluation Techniques"** (Castro, chair) and **"FDD Using Real Building Data"** (Ahmed, chair).

Todd Rossi will be the new subcommittee chair.

Minutes of the subcommittee meeting are in Appendix B.

### **Applications (House)**

House reviewed progress on **RP-1020 (Demonstration of Fault Detection and Diagnostic Methods in a Real Building)**. The contractors, Loughborough University and MIT, are preparing for a visit immediately after the ASHRAE meeting to the Iowa Energy Center's Energy Resource Station, to conduct equipment commissioning tests. Wright will replace Haves as PI from Loughborough.

House reviewed the latest revisions to a work statement on **Integrated Control for Building Services (Research Priority #1)**. This intent of the work is to understand the costs and benefits of integration across major building systems, by surveying stakeholders and buildings. It was moved (House) and seconded (Blanc) that TC4.11 approve this work statement and send it to RAC. The motion was approved 10-0-0 (chair voting); one voting member (Braun) had not yet arrived. The PMS will be Kintner-Meyer, House, Barker; Kelly will ask Dexter as well. House solicited candidate buildings for the survey required in the workstatement.

Blanc provided an update of the Philip Burton Federal Office Building project in San Francisco, a 1.4 million square foot office building and courthouse managed by GSA that is a demonstration site for a variety of energy-efficiency improvements, controls upgrades and BACnet communications. The BACnet system has

5-6 months of operation and is essentially complete. The control system is working very well, more progress is needed for the alarm and notification system, and there is little integration among systems.

Klaassen stated that the Iowa Energy Center has a DOE contract as well as a major role in RP-1020.

Minutes of the subcommittee meeting are in Appendix C.

### **Utility/Building Interface (Blanc)**

Blanc reported on program and research ideas. Kintner-Meyer plans to chair a seminar in Chicago, **"Customer Experiences with Real-Time Pricing Electric Rates"** and a seminar in Seattle **"Communications and Other Issues Dealing with Life Safety, Fire Alarm, and HVAC Systems Integration"**. The subcommittee received a comprehensive one-page research-project description on communications encryption and issues involving private and shared information from Burns, Kintner-Meyer and McParland.

Norford reviewed progress on **RP-1011 (Utility/EMCS Communication Protocol Requirements)**. PI Kintner-Meyer left SAIC to join PNNL, requiring a change in the project budget. It was moved (Norford) and seconded (Blanc) that TC.4.11 recommend that ASHRAE increase the contract amount by \$7852. The motion passed, 10-0-1 (chair voting).

Blanc provided an update on real-time pricing and the deregulation of the electric-power industry. ESource has recently issued a comprehensive report on real-time pricing. The California Power Exchange has been functioning since March 1998, with evening prices as low as zero, reflecting the fact that baseload power plants cannot be turned off.

Kintner-Meyer will take over as subcommittee chair.

The minutes of the subcommittee meeting are in Appendix D.

### **Program Subcommittee (Lomonaco)**

Lomonaco presented the program for Chicago. After discussion about priorities for planned sessions, it was moved (Lomonaco) and seconded (Mitchell) that the program be approved. The motion was passed by voice vote. The program, with priorities identified, is included in the list of TC activities on pages 3 and 4 of these minutes. It was moved (Mitchell) and seconded (Blanc) to approve the program for Seattle. The motion passed by voice vote. The Seattle program is also included in the list of TC activities, with no priorities at this time.

The minutes of the subcommittee meeting were not submitted in electronic form by the subcommittee chair.

### **Research Subcommittee (Braun)**

Braun distributed copies of the proposed long-range research plan. He noted that ASHRAE now requires a statement of research objectives, which will be used by the Research Planning Subcommittee of RAC in constructing ASHRAE's Research Plan. Haves noted that the summary as drafted does not identify specific



needs and a strategy to meet them. Braun was empowered to amplify the draft summary. The long-range research plan includes a new item, Prototyping and Field Testing of ASHRAE's Utility Consumer Interface Models (UCIM). The priority for research ideas was discussed at length. It was moved (Braun) and seconded (Blanc) that TC4.11 approve the research plan with priorities as revised by Braun. The motion passed 9-0-0 (chair voting).

The revised statement of research objectives, the research plan with priorities as approved, and the one-page research summaries are included in Appendix G.

### **Roster**

The roster for the July 1, 1998 - June 30, 1999 ASHRAE year includes the following: Braun (chair), Mitchell (vice-chair), Norford (secretary), and Kelly (research subcommittee chair). In addition to subcommittee chairs noted earlier, Lomonaco (program) and House (applications) will continue in their present posts.

### **New Business**

Kelly stated TC4.11 would also benefit from a web site, for current and archived minutes. Hackner will explore this with a colleague at the Energy Center of Wisconsin. The TC decided that no official liaisons with TCs 1.4 and 4.6 are needed. It was moved (Braun) and seconded (Mitchell) that the Program Subcommittee meet the last 15 minutes of each of the three technical subcommittee meetings. The motion, made to ensure adequate participation in program meetings, passed by voice vote without opposition.

ASHRAE (TAC) has asked for input into ASHRAE 2000, particularly concerning building energy use and the indoor environment. Braun suggested that Kelly provide the statement of research objectives that motivates the TC's research plan.

There is no immediate need for guidelines, standards or a handbook chapter from TC4.11. Kelly noted that there may be guidelines in the future for entering data into FDD methods and for evaluation of these methods. Braun stated that a handbook chapter might be considered in the future.

### **Adjourn**

Motion to adjourn was made by Braun and seconded by Blanc. The meeting was adjourned at 5:30 p.m.

### **Appendices**

- A. Call to Meeting and Agenda
- B. FDD Subcommittee Report
- C. Applications Subcommittee Report
- D. Building/Utility Interface Subcommittee Report
- E. Program Subcommittee Report
- F. List of Subcommittee Attendees
- G. Research Plan and Activities
- H. Integrated Control for Building Services
  - I. Survey of Degradation Fault Levels in Vapor Compression Air Conditioners
  - J. Development and Demonstration of Recursive Training Techniques for Model-Based FDD Methods

on Vapor Compression Equipment

**ASHRAE** American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

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Reply to: George E. Kelly

Room B114 Bldg. 226

NIST

Gaithersburg, MD 20899

May 18, 1998

Dear TC 4.11 Member,

International Member,

Corresponding Member, or

Visitors to the TG Meeting in Boston

The **TC** on Smart Building Systems and its subcommittees will meet in Toronto according to the following schedule:

TC 4.11 Fault Det. & Diagnostic Sub. Sunday (6/21) 3:00-4:00pm

TC 4.11 Applications Sub. Sunday (6/21) 4:00-5:00pm

TC 4.11 Utility/Bldg. Interface Sub. Sunday (6/21) 5:00-6:00pm

TC 4.11 Program Sub. Sunday (6/21) 6:00-7:00pm

**TC 4.11 Smart Building Systems Tuesday (6/23) 3:30-5:30pm**

Please consult your ASHRAE Program Booklet for meeting place locations.

The TC is the lead sponsor of one program sessions in Toronto. It is Seminar 3, **Information Gateways: Interactive Building Database and Application Platforms**, 8:00 a.m. - 10:00 a.m., Sunday, 6/21. In addition, the TC is cosponsoring with TC 1.04 three other technical program sessions, Seminar 20, Forum 21, and Symposium 21. (See the ASHRAE Program Booklet for session locations and times.)

Below is a draft agenda for the full TC 4.11 committee meeting in Toronto. I am looking forward to seeing you all there.

Sincerely,

George E. Kelly

Chairman, TC 4.11

cc: Erv Bales, TAC Chairman

Jeffery Biskup, TAC Section 4 Head

Carl Speich, R&T Research Liaison

Claire Ramspeck, Manager of Technical Services

Bill Seaton, Manager of Research

**ASHRAE TC 4.11**  
**Smart Building Systems**  
**1998 Annual Meeting, Toronto**  
**DRAFT AGENDA**

**Location: (See ASHRAE Program Booklet for meeting location.)**

**Date: Tuesday, June 23, 1998**

**Time: 3:30 - 5:30 p.m.**

1. Roll call and introductions
2. Approval of Minutes from San Francisco
3. Announcements
4. FDD Subcommittee Report (John Seem)

1043-RP, Fault Detection and Diagnostic (FDD) Requirements and Evaluation Tools

for Chillers (John Seem)

Draft Work Statements

Program plans

IEA Annex 34 update

Other FDD research activities

5. SBS Applications Subcommittee Report (John House)

1020-RP, Demonstration of Fault Detection and Diagnostic Methods in a Real

Building (John House)

Draft Work Statements

Program plans

Philip Burton Office Building update

Iowa Energy Center update

Other possible demonstration sites

6. Utility/Bldg. Interface Subcommittee Report (Steve Blanc)

1011-RP, Utility/EMCS Communication Protocol Requirements (Les Norford)

Draft Work Statements

Program plans

Real time pricing/Deregulation update

7. Research Subcommittee Report (Jim Braun)

New Work Statements

1999 - 2000 Research Plan

8. Program Subcommittee Report (Carol Lomonaco)

Plans for Chicago (1/99)

Plans for Seattle (6/99)

Plans for future meetings

9. TC 4.11 1999 Roster

10. Additional old business

11. Additional new business

12. Adjournment